Ultra-high-Q Nanomechanics for quantum experiments and precision measurement: A new twist

Nanomechanical resonators have recently achieved quality factors in excess of 1 billion using strain and mode-shape engineering. Attractive features of these devices include attonewton force sensitivies, thermal coherence times of milliseconds, and zero-point displacement amplitudes in excess of picometers, spurring proposals from room temperature quantum experiments to ultra-fast force microscopy.  I'll review these developments in the context of a new class of ultra-high-Q nanomechanical resonators based on torsion modes of strained nanoribbons, highlighting their potential use in a new generation of applications including imaging-based quantum optomechanics, precision optomechanical inertial sensing, and optomechanical dark matter searches.